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Low, Daniel

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tel: +44 1970 62 2400
email: is@aber.ac.uk

Reliability of gait related data determined via the shank attached Sensoria smart sock accelerometer during running and walking

Daniel C Low¹

¹Institute of Biology, Environmental and Rural Sciences, Aberystwyth University.
dal38@aber.ac.uk

The ability of a gait measuring system to collect reliable data is a key research consideration when investigating differences in individuals' gait. Gait data has been accurately and reliably determined using shank positioned accelerometers (Sinclair et al., 2013, *Journal of Applied Biomechanics*, 29, 118-122). However, the reliability of data obtained from the Sensoria smart sock, which utilises a shank positioned triaxial accelerometer, is not yet known. This is the focus of this investigation. Following institutional ethics approval, eleven male participants (age 23.4 years (\pm 4.4), weight 87.0 kg (\pm 16.6)) wore the same pair of Sensoria smart socks and walked (5.04 km/hr) and ran (self-selected pace. Ave. 9.87 km/hr) on a treadmill. Data from the accelerometers collecting at 32 Hz were recorded via a tablet computer, connected to the smart sock accelerometer via Bluetooth technology. Data were stored on an on-line platform and was accessed via a desktop computer following data collection. Using the raw acceleration data, key events in the anterior-posterior and vertical directions were used to establish ground contact (Sinclair et al., 2013; Kavanagh, J. J., 1999, *Journal of NeuroEngineering and Rehabilitation*, 6, 1-10; Whelen et al., 2015, June-July. *Proceedings of International Conference on Biomechanics in Sport*, Poitiers, France). A total of 8 steps were established per foot; foot contact time and stride time were calculated for each step. Intraclass Correlation Coefficients (ICC(3,1)) were determined for each foot and locomotion mode separately. Results showed that all ICC's were significant ($p < 0.01$) and demonstrated good to excellent reliability for stride time during walking (right foot mean time = 1.06 secs, ICC = 0.78; left foot mean time = 1.05, ICC = 0.69) and running (right foot mean time = 0.75 secs, ICC = 0.75; left foot mean time = 0.74 secs, ICC = 0.75). Foot contact time demonstrated good reliability when walking (right foot mean time = 0.59 s, ICC = 0.62; left foot mean time = 0.6, ICC = 0.7) and good and excellent reliability when running (right foot mean time = 0.23 s, ICC = 0.64; left foot mean time = 0.23, ICC = 0.78). Steps recorded also matched the number visually observed. In conclusion, Sensoria smart sock accelerometers provide reliable data which can be used confidently in research investigations to collect data such as foot contact and stride time and cadence which are associated with different pathological conditions (Moon et al., 2016, *Human Movement Science*, 47, 197).